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DISPOSABLE ABSORBENT ARTICLES HAVING A STRETCH PANEL AND AN INTEGRATED WAIST SIZE ADJUSTMENT MECHANISM

Field of the Invention

The present invention relates to disposable absorbent articles which are adapted to contain body exudates. More particularly, the present invention relates to absorbent articles having fit panels which include an integrated waist size adjustment mechanism for improved fit and performance.

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Background of the Invention

It is desired that absorbent articles such as diapers, training pants or incontinence garments provide a close, comfortable fit about the wearer and contain body exudates. Moreover, it is desirable that such absorbent articles, after being soiled, can be removed from the wearer in a convenient and clean manner without undesirably soiling the care giver or surrounding area such as the clothes of the wearer.

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Conventional diapers have typically included a front waist portion and a rear waist portion which are releasably connected about the hips of the wearer during use by conventional fasteners such as adhesive tape fasteners or hook and loop type fasteners. For example, the conventional fasteners have typically included a pair of fasteners, such as adhesive tape tabs, located on the outermost corners of the diaper in the rear waist region of the diaper and a complimentary fastener, such as a taping panel, located on the outer surface of the outer cover of the diaper in the front waist portion of the diaper. In such a configuration, the diaper has been positioned between the legs of the wearer while the wearer is lying down and the adhesive tape tabs have been releasably attached to the

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taping panel to secure the rear waist portion to the front waist portion of the diaper to secure the diaper about the waist of the wearer. Such conventional diapers are easy to fasten about and remove from the wearer after use without undesirably soiling the care giver. However, such conventional diapers do not typically provide a secondary mechanism for adjusting the waist size after the fasteners have been releasably engaged.

Several attempts have been made to provide absorbent articles which effectively contain body exudates and which include a secondary fastening system to further conform the waist portions of the articles after the primary fasteners have been releasably engaged. However, many of such attempts have not been completely satisfactory.

Further, diapers having elasticized waistbands or flaps at their waist regions and elasticized fastening systems have not been completely satisfactory. For example, such waistbands have generally been narrow and consequently have not always provided a reliable sealing surface with the wearer's body, resulting in leakage. Moreover, although the elasticized fastening systems used on conventional diapers have improved the fit of the diaper about the wearer, such systems have typically not been tied in or connected to the elasticized waistbands and flaps. Thus, the forces exerted on the fastening system have not been efficiently transferred and distributed laterally across the waist region of the diaper along a wide band. As a result, the fit and containment of some conventional absorbent articles have not been completely satisfactory.

Accordingly, despite the attempts to develop improved absorbent articles, there remains a need for absorbent articles which conform to the wearer to effectively contain bodily exudates, which are readily secured about and removed from the wearer in a convenient and clean manner, and which provide improved fit and containment at the waist regions.

Summary of the Invention

In response to the difficulties and problems discussed above, new refastenable, disposable absorbent articles which have a fit panel and an integrated waist size adjustment mechanism have been invented.

In one aspect, the present invention concerns a refastenable, disposable absorbent article which comprises an absorbent chassis which defines a front waist region, a rear waist region, a crotch region which extends between and connects the waist regions, a pair of longitudinally opposed end edges, and a pair of laterally opposed side edges. The

absorbent article also includes at least one fit panel which is located in one of the waist regions and which defines a waist edge, a pair of laterally opposed outboard edges which are located laterally beyond both of the side edges of the absorbent chassis, and an inward edge which is located longitudinally inward from the end edge of the absorbent chassis. The absorbent article further includes a pair of primary fasteners which are located on the laterally opposed outboard edges of the fit panel and which are configured to releasably engage the opposite waist region of the absorbent chassis to provide the disposable absorbent article.

The absorbent article further includes a waist size adjustment mechanism, such as a secondary fastener tab, which is configured to further conform the waist regions of the article to the wearer's body after the primary fasteners have been releasably engaged. The secondary fastener tab may be created by a pair of laterally directed perforations on at least one of two laterally opposed sides of the fit panel.

In one embodiment, the fit panel may be provided by two laterally spaced apart side panels, each connected to one of the laterally opposed side edges of the absorbent chassis. In such a configuration, each of the side panels defines the waist edge, the inward edge and one of the laterally opposed outboard edges of the fit panel. Each of the side panels also includes one of the primary fasteners thereon and at least one of the side panels includes the integral waist size adjustment mechanism, such as a secondary fastener tab.

The present invention advantageously provides refastenable, disposable absorbent articles that include a fit panel which includes an integrated waist size adjustment mechanism. In particular, the various aspects of the present invention can advantageously provide an absorbent article having a more contouring fit and improved gasketing about the waist of the wearer, resulting in increased comfort, reduced leakage, and enhanced aesthetics.

Brief Description of the Drawings

The present invention will be more fully understood and further advantages will become apparent when reference is made to the following detailed description of the invention and the accompanying drawings wherein like numerals represent like elements. The drawings are merely representative and are not intended to limit the scope of the appended claims.

Fig 1 representatively shows a perspective view of an example of a disposable absorbent article of the present invention fastened about a wearer;

Fig. 2 representatively shows a front plan view of the disposable absorbent article of Fig. 1;

Fig. 3 representatively shows a side view of the disposable absorbent article of Fig. 1;

Fig. 4 representatively shows a plan view of the disposable absorbent article of Fig. 1 in an unfastened, stretched, laid-flat condition with the surface of the article which contacts the wearer facing the viewer and with portions of the article cut away to show the underlying features;

Fig. 5 representatively shows a top plan view of a portion of the disposable absorbent article of Fig. 1 in an unfastened, stretched, laid-flat condition with the surface of the article which contacts the wearer facing the viewer;

Fig. 6 representatively shows a top plan view of a portion of the disposable absorbent article of Fig. 1 in an unfastened, stretched, laid-flat condition with the surface of the article which contacts the wearer facing the viewer; and

Fig. 7 representatively shows a top plan view of a portion of another example of a disposable absorbent article according to the present invention in an unfastened, stretched, laid-flat condition with the surface of the article which contacts the wearer facing the viewer.

Detailed Description of the Invention

The present invention concerns disposable absorbent articles which are adapted to be worn adjacent to the body of a wearer to absorb and contain various exudates discharged from the body. The absorbent articles are configured to closely conform to the body of the wearer to effectively contain body exudates. The absorbent articles are also refastenable such that they can be secured to and removed directly from the waist of the wearer and easily inspected to determine if they have been soiled during use. As used herein, the term "disposable" refers to articles which are intended to be discarded after a limited use and which are not intended to be laundered or otherwise restored for reuse.

The disposable absorbent articles of the present invention will be described in terms of a disposable, diaper article which is adapted to be worn by infants about the lower torso. In particular, the disposable absorbent articles will be described in terms of a disposable diaper having a fit panel, a primary fastening system and at least one integrated waist size adjustment mechanism. It is understood that the articles and methods of the present invention are equally adaptable for other types of absorbent articles such as adult incontinent products, training pants, feminine hygiene products, other personal care or health care garments, and the like.

Figs. 1-6 representatively show various views of one example of a disposable diaper, as generally indicated at 20, of the present invention. The illustrated diaper 20 includes an absorbent chassis 28 which generally defines a front waist region 22, a rear waist region 24, and a crotch region 26 which extends between and connects the front and rear waist regions 22 and 24. The absorbent chassis 28 further defines a pair of laterally opposed side edges 30, a pair of longitudinally opposed waist edges 32, an interior bodyfacing surface 34 which is configured to contact the wearer, an outer garment facing surface 36 opposite the interior surface 34 which is configured to contact the wearer's clothing in use, a longitudinal direction 38, and a lateral direction 40. As representatively illustrated in Fig. 4, the absorbent chassis 28 may include an outer cover 42, a bodyside liner 44 which is connected to the outer cover 42 in a superposed relation, and an absorbent core 46 which is located between the outer cover 42 and the bodyside liner 44.

The front waist region 22 comprises the portion of the diaper 20 which, when worn, is positioned on the front of the wearer while the rear waist region 24 comprises the portion of the diaper 20 which, when worn, is positioned on the back of the wearer. The crotch region 26 comprises the portion of the diaper 20 which, when worn, is positioned between the legs of the wearer and covers the lower torso of the wearer. The laterally opposed side edges 30 of the absorbent chassis 28 of the diaper 20 generally define leg openings which may be curvilinear. The waist edges 32 of the absorbent chassis 28 of the diaper 20 are configured to encircle the waist of the wearer when worn and provide a waist opening when fastened that defines a waist perimeter dimension.

The diaper 20 of the different aspects of the present invention also includes at least one fit panel 70. For example, as representatively illustrated in Figs. 1-6, the diaper 20 may include a fit panel located on the bodyfacing surface 34 of the absorbent chassis 28 in the rear waist region 24 of the diaper 20. As illustrated in Fig. 4, the fit panel 70 may generally define a waist edge 72, a pair of laterally opposed outboard edges 74 which are located

laterally beyond the side edges 30 of the absorbent chassis 28, and an inward edge 76 which is located longitudinally inward from the waist edge 72. The fit panel 70 may be provided by a single piece of material or combination of materials that extend across the entire width of the absorbent chassis 28. Alternatively, as representatively illustrated in Fig. 7, the fit panel 70 may be provided by a pair of side panels 90 and 92 that are connected to the side edges 30 of the absorbent chassis 28 in a laterally spaced apart configuration.

The diaper 20 of the present invention further includes a refastenable fastening system 60. The fastening system 60 includes a pair of primary fasteners 62, attached to the laterally opposed outboard edges 74 of the fit panel 70. As representatively illustrated in Figs. 1-3, the primary fasteners 62 are configured to releasably engage the garment facing surface 36 of the absorbent chassis 28 to provide the diaper 20. The fastening system 60 may further include an attachment panel 66 located on the outer surface of the absorbent chassis 28 to which the primary fasteners 62 are configured to releasably engage.

The absorbent chassis 28 is configured to contain and/or absorb any body exudates discharged from the wearer. Whereas, the fit panel 70 and the refastenable fastening system 60 are configured to maintain the diaper 20 about the waist of the wearer and provide a garment-like appearance. The diaper 20 may further include leg elastics 54, containment flaps 56, and waist elastics 58 as are known to those skilled in the art. It should be recognized that individual components of the diaper 20 may be optional depending upon the intended use of the diaper 20.

The diaper 20 may be of various suitable shapes. For example, in the unfastened configuration, the diaper may have an overall rectangular shape, T-shape or an approximately hour-glass shape. In the illustrated embodiments, the diaper 20 has a generally hour-glass shape in an unfastened configuration. Examples of diaper configurations suitable for use in connection with the instant application and other diaper components suitable for use on diapers are described in U.S. Patent 4,798,603 issued January 17, 1989, to Meyer et al.; U.S. 5,176,668 issued January 5, 1993, to Bernardin; U.S. 5,176,672 issued January 5, 1993, to Bruemmer et al.; U.S. 5,192,606 issued March 9, 1993, to Proxmire et al., and U.S. 5,509,915 issued April 23, 1996, to Hanson et al., the disclosures of which are herein incorporated by reference. The various aspects and configurations of the invention can provide distinctive combinations of softness, body conformity, reduced red-marking of the wearer's skin, reduced skin hydration, improved containment of body exudates and improved aesthetics.

The various components of the diaper 20 are integrally assembled together employing various types of suitable attachment means, such as adhesive, sonic and thermal bonds or combinations thereof. In the shown embodiments, for example, the outer cover 42 and bodyside liner 44 are assembled to each other and to the absorbent core 46 with adhesive, such as a hot melt, pressure-sensitive adhesive. The adhesive may be applied as a uniform continuous layer of adhesive, a patterned layer of adhesive, a sprayed pattern of adhesive, or an array of separate lines, swirls or dots of adhesive. Similarly, other diaper components, such as the leg elastic 54 and the primary fasteners 62, may be assembled into the diaper 20 article by employing the above-identified attachment mechanisms. Desirably, the majority of the diaper components are assembled together using ultrasonic bonding techniques for reduced manufacturing cost and improved performance.

The outer cover 42 of the absorbent chassis 28 of the diaper 20, as representatively illustrated in Fig. 4, may suitably be composed of a material which is either liquid permeable or liquid impermeable. It is generally preferred that the outer cover 42 be formed from a material that is substantially impermeable to liquids. A typical outer cover can be manufactured from a thin plastic film or other flexible liquid-impermeable material. For example, the outer cover 42 may be formed from a polyethylene film having a thickness of from about 0.013 millimeter (0.5 mil) to about 0.051 millimeter (2.0 mils). If it is desired to present the outer cover 42 with a more clothlike feeling, the outer cover 42 may comprise a polyolefin film having a nonwoven web laminated to the outer surface thereof, such as a spunbond web of polyolefin fibers. For example, a stretch-thinned polypropylene film having a thickness of about 0.015 millimeter (0.6 mil) may have thermally laminated thereto a spunbond web of polypropylene fibers, which fibers have a thickness of about 1.5 to 2.5 denier per filament, which nonwoven web has a basis weight of about 17 grams per square meter (0.5 ounce per square yard). Methods of forming such clothlike outer covers are known to those skilled in the art.

Further, the outer cover 42 may be formed of a woven or nonwoven fibrous web layer which has been totally or partially constructed or treated to impart a desired level of liquid impermeability to selected regions that are adjacent or proximate the absorbent core 46. Still further, the outer cover 42 may optionally be composed of a micro-porous "breathable" material which permits vapors to escape from the absorbent core 46 while still preventing liquid exudates from passing through the outer cover 42. For example, the

outer cover 42 may comprise a microporous polyolefin film having a nonwoven web laminated to the outer surface thereof, such as a spunbond web of polyolefin fibers.

The outer cover 42 can also be embossed or otherwise provided with a matte finish to provide a more aesthetically pleasing appearance. Additionally, the outer cover 42 may be comprised of a necked material such as a necked spunbond web of polyolefin fibers or elasticized nonwoven materials to allow the outer cover 42 to stretch more freely in conjunction with the fit panel 70. Examples of suitable elasticized materials are stretch-thermal laminate (STL), neck-bonded laminate (NBL), and stretch-bonded laminate (SBL). Methods of making such materials are well known to those skilled in the art and described in U.S. Patent No. 4,663,220 issued May 5, 1987 to Wisneski et al., U.S. Patent No. 5,226,992 issued July 13, 1993 to Mormon, and European Patent Application No. EP 0 217 032 published on April 8, 1987 in the names of Taylor et al., the disclosures of which are hereby incorporated as references.

The bodyside liner 44, as representatively illustrated in Fig. 4, suitably presents a bodyfacing surface which is compliant, soft feeling, and nonirritating to the wearer's skin. Further, the bodyside liner 44 may be less hydrophilic than the absorbent core 46, to present a relatively dry surface to the wearer, and may be sufficiently porous to be liquid permeable, permitting liquid to readily penetrate through its thickness. A suitable bodyside liner 44 may be manufactured from a wide selection of web materials, such as porous foams, reticulated foams, apertured plastic films, natural fibers (for example, wood or cotton fibers), synthetic fibers (for example, polyester or polypropylene fibers), or a combination of natural and synthetic fibers. The bodyside liner 44 is suitably employed to help isolate the wearer's skin from liquids held in the absorbent core 46.

Various woven and nonwoven fabrics can be used for the bodyside liner 44. For example, the bodyside liner may be composed of a meltblown or spunbonded web of polyolefin fibers. The bodyside liner may also be a bonded-carded web composed of natural and/or synthetic fibers. The bodyside liner may be composed of a substantially hydrophobic material, and the hydrophobic material may, optionally, be treated with a surfactant or otherwise processed to impart a desired level of wettability and hydrophilicity. In a particular embodiment of the present invention, the bodyside liner 44 comprises a nonwoven, spunbond, polypropylene fabric composed of about 2.8-3.2 denier fibers formed into a web having a basis weight of about 20 grams per square meter and a density of about 0.13 gram per cubic centimeter. The fabric may be surface treated with about 0.3 weight percent of a surfactant commercially available from Hodgson Textile

Chemicals, Inc. under the trade designation AHCOVEL Base 62. The surfactant may be applied by any conventional means, such as spraying, printing, brush coating or the like. The surfactant may be applied to the entire bodyside liner 44 or may be selectively applied to particular sections of the bodyside liner 44, such as the medial section along the longitudinal centerline of the diaper, to provide greater wettability of such sections. The bodyside liner 44 may further include a lotion or treatment applied thereto which is configured to treat or be transferred to the wearer's skin.

The absorbent core 46 of the diaper 20, as representatively illustrated in Fig. 4, may suitably comprise a matrix of hydrophilic fibers, such as a web of cellulosic fluff, mixed with particles of a high-absorbency material commonly known as superabsorbent material. In a particular embodiment, the absorbent core 46 comprises a matrix of cellulosic fluff, such as wood pulp fluff, and superabsorbent hydrogel-forming particles. The wood pulp fluff may be exchanged with synthetic, polymeric, meltblown fibers or with a combination of meltblown fibers and natural fibers. The superabsorbent particles may be substantially homogeneously mixed with the hydrophilic fibers or may be nonuniformly mixed. The fluff and superabsorbent particles may also be selectively placed into desired zones of the absorbent core 46 to better contain and absorb body exudates. The concentration of the superabsorbent particles may also vary through the thickness of the absorbent core 46. Alternatively, the absorbent core 46 may comprise a laminate of fibrous webs and superabsorbent material or other suitable means of maintaining a superabsorbent material in a localized area.

The absorbent core 46 may have any of a number of shapes. For example, the absorbent core may be rectangular, I-shaped, or T-shaped. It is generally preferred that the absorbent core 46 be narrow in the crotch area of the diaper 20. It has been found that the absorbent chassis 28 of the present invention is particularly useful when the width dimension in the crotch region 26 is from about 2.5 to about 12.7 centimeters (1.0 to about 5.0 inches) and desirably no more than about 7.6 centimeters (3.0 inches). The narrow crotch width dimension of the absorbent chassis 28 allows the absorbent chassis 28 to better fit between the legs of the wearer. The size and the absorbent capacity of the absorbent core 46 should be compatible with the size of the intended wearer and the liquid loading imparted by the intended use of the absorbent article.

The high-absorbency material can be selected from natural, synthetic, and modified natural polymers and materials. The high-absorbency materials can be inorganic materials, such as silica gels, or organic compounds, such as crosslinked polymers. The

term "crosslinked" refers to any means for effectively rendering normally water-soluble materials substantially water insoluble but swellable. Such means can include, for example, physical entanglement, crystalline domains, covalent bonds, ionic complexes and associations, hydrophilic associations such as hydrogen bonding, and hydrophobic associations or Van der Waals forces.

Examples of synthetic, polymeric, high-absorbency materials include the alkali metal and ammonium salts of poly(acrylic acid) and poly(methacrylic acid), poly(acrylamides), poly(vinyl ethers), maleic anhydride copolymers with vinyl ethers and alpha-olefins, poly(vinyl pyrrolidone), poly(vinyl morpholinone), poly(vinyl alcohol), and mixtures and copolymers thereof. Further polymers suitable for use in the absorbent core include natural and modified natural polymers, such as hydrolyzed acrylonitrile-grafted starch, acrylic acid grafted starch, methyl cellulose, carboxymethyl cellulose, hydroxypropyl cellulose, and the natural gums, such as alginates, xanthum gum, locust bean gum, and the like. Mixtures of natural and wholly or partially synthetic absorbent polymers can also be useful in the present invention. Such high-absorbency materials are well known to those skilled in the art and are widely commercially available. Examples of superabsorbent polymers suitable for use in the present invention are SANWET IM 3900 polymer available from Hoechst Celanese located in Portsmouth, Virginia and DOW DRYTECH 2035LD polymer available from Dow Chemical Co. located in Midland, Michigan.

The high absorbency material may be in any of a wide variety of geometric forms. As a general rule, it is preferred that the high absorbency material be in the form of discrete particles. However, the high absorbency material may also be in the form of fibers, flakes, rods, spheres, needles, or the like. As a general rule, the high absorbency material is present in the absorbent body in an amount of from about 5 to about 90 weight percent based on total weight of the absorbent core.

Optionally, a substantially hydrophilic tissue wrapsheet (not illustrated) may be employed to help maintain the integrity of the airlaid fibrous structure of the absorbent core. The tissue wrapsheet is typically placed about the absorbent body over at least the two major facing surfaces thereof and composed of an absorbent cellulosic material, such as creped wadding or a high wet-strength tissue. In one aspect of the invention, the tissue wrapsheet can be configured to provide a wicking layer which helps to rapidly distribute liquid over the mass of absorbent fibers comprising the absorbent body. The wrapsheet material on one side of the absorbent fibrous mass may be bonded to the wrapsheet

located on the opposite side of the fibrous mass to effectively entrap the absorbent core 46.

As representatively illustrated in Figs. 1 and 4, the absorbent chassis 28 of the disposable
 5 diaper 20 may include a pair of containment flaps 56 which are configured to provide a
 barrier to the lateral flow of body exudates. The containment flaps 56 may be located
 along the laterally opposed side edges 30 of the absorbent chassis 28. Each containment
 flap 56 typically defines an unattached edge which is configured to maintain an upright,
 perpendicular configuration in at least the crotch region 26 of the diaper 20 to form a seal
 10 against the wearer's body. The containment flaps 56 may extend longitudinally along the
 entire length of the absorbent chassis 28 or may only extend partially along the length of
 the absorbent chassis 28. When the containment flaps 56 are shorter in length than the
 absorbent chassis 28, the containment flaps 56 can be selectively positioned anywhere
 along the side edges 30 of the absorbent chassis 28. In a particular aspect of the
 15 invention, the containment flaps 56 extend along the entire length of the absorbent chassis
 28 to better contain the body exudates. Such containment flaps 56 are generally well
 known to those skilled in the art. For example, suitable constructions and arrangements
 for containment flaps 56 are described in U.S. Patent 4,704,116 issued November 3,
 1987, to K. Enloe the disclosure of which is hereby incorporated by reference.

The disposable diaper 20 of the different aspects of the present invention may further
 include elastics at the waist edge 32 and side edges 30 of the absorbent chassis 28 of the
 diaper 20 to further prevent leakage of body exudates and support the absorbent chassis
 28. For example, as representatively illustrated in Figs. 1, 2 and 4, the diaper 20 of the
 25 present invention may include a pair of leg elastic members 54 which are connected to the
 laterally opposed side edges 30 of the absorbent chassis 28 in the crotch region 26 of the
 diaper 20 and a waist elastic member 58 which is connected to the waist edge 32 of the
 absorbent chassis 28 of the diaper 20. The leg elastics 54 and waist elastic 58 are
 generally adapted to fit about the legs and waist of a wearer in use to maintain a positive,
 30 contacting relationship with the wearer to effectively reduce or eliminate the leakage of
 body exudates from the diaper 20.

Materials suitable for use as the leg elastics 54 and waist elastic 58 are well known to
 those skilled in the art. Exemplary of such materials are sheets or strands or ribbons of a
 35 polymeric, elastomeric material which are adhered to the outer cover 42 in a stretched
 position, or which are attached to the outer cover 42 while the outer cover is pleated, such

that elastic constrictive forces are imparted to the outer cover 2. The leg elastics may also include such materials as polyurethane, synthetic and natural rubber.

The diaper 20 of the different aspects of the present invention further includes at least one fit panel 70 located in at least one of the waist regions 22 and 24 to provide a more comfortable, contouring fit about the wearer. The diaper 20 may include a fit panel 70 disposed in both waist regions 22 and 24 and, desirably, the diaper includes a fit panel 70 in at least the rear waist region 24. For example, as representatively illustrated in Figs. 1-6, the diaper 20 includes a fit panel 70 located on the bodyfacing surface 34 in the rear waist region 24 of the absorbent chassis 28 and extending laterally across the width and laterally outboard of absorbent chassis 28. Alternatively, as representatively illustrated in Fig. 7, the fit panel 70 may be provided by a pair of side panels 90 and 92 that are connected to the side edges 30 of the absorbent chassis 28 in a laterally spaced apart configuration.

The illustrated fit panel 70 generally defines a waist edge 72, a pair of laterally opposed outboard edges 74 which are located laterally beyond the side edges 30 of the absorbent chassis 28, and an inward edge 76 which is located longitudinally inward from the waist edge 72. As illustrated in Fig. 6, the fit panel 70 may further define a width 71 in the lateral direction 40 and a length 73 in the longitudinal direction 38.

The fit panel 70 is configured to elongate or extend in the lateral direction 40 at least about 30 percent and desirably at least about 50 percent to provide an improved fit and appearance of the diaper about the wearer by initially providing a conforming fit about the wearer and maintaining such fit throughout the use of such diaper. The fit panel 70 is also configured such that the absorbent chassis 28 has the ability to expand, contract, and receive body exudates without adversely affecting the positioning of the fit panel and the diaper about the waist of the wearer. Thus, with such a fit panel 70, movements of the wearer may move the absorbent chassis 28 but do not adversely affect the overall positioning of the diaper on the wearer. Such improved fit results in reduced leakage from the waist and leg regions of the diaper and a more aesthetically pleasing appearance.

In a particular embodiment, the fit panel 70 may be secured to the absorbent chassis 28 of the diaper 20 such that in an unstrained configuration the fit panel 70 effectively contracts the waist region of the absorbent chassis 28 in the lateral direction 40. Desirably, the fit panel 70 may be secured to the absorbent chassis 28 such that the width of the fit panel 70 in the lateral direction 40 between the points at which it is attached to the absorbent

chassis 28 is less than a fully extended width of the absorbent chassis 28. For example, the fit panel 70 may be elongated and attached to the absorbent chassis 28 of the diaper 20 in an elastically contractible condition while the chassis of the diaper is in an uncontracted condition. Alternatively, the fit panel 70 may be secured to the absorbent chassis 28 of the diaper when the absorbent chassis is in a tucked or pleated condition. The fit panel 70 may otherwise include a latent elastic material along at least a portion of its width 71 such that, after activation, the latent elastic material effectively contracts the waist region of the absorbent chassis 28.

In such a configuration, the fit panel 70 is desirably secured to the absorbent chassis 28 of the diaper 20 such that, in an unstrained configuration, the absorbent chassis 28 of the diaper is gathered from about 3 to about 50 percent, more desirably from about 5 to about 30 percent, and most desirably from about 7 to about 20 percent. As a result, the portion of the fit panel 70 between the side edges 30 of the absorbent chassis 28 may be capable of elongating in the lateral direction from a relaxed condition until the absorbent chassis is extended to its full width to provide the improved fit and containment. To provide even further extension, the absorbent chassis 28 may include materials which are capable of extension such as necked or elastic materials. As a result of its elastic or extension properties, the fit panel 70 is able to snugly fit the wearer's body independent of the absorbent chassis 28 and any forces exerted on the chassis due to movements of the wearer and loading for improved performance.

Alternatively, in other embodiments such as that illustrated in Fig. 7, the fit panel 70 or the pair of illustrated side panels 90 and 92 which provide the fit panel may not be attached to the absorbent chassis 28 in a manner which contracts or gathers the absorbent chassis.

As illustrated in the various embodiments of the present invention, the laterally outboard edges 74 of the fit panel 70 extend beyond the side edges 30 of the absorbent chassis 28 of the diaper 20. The waist edge 72 of the fit panel 70 is also generally coterminous with the end edge 32 of the chassis 28 of the diaper 20 in the respective waist region 22 or 24 in the illustrated embodiments. Alternatively, the waist edge 72 of the fit panel 70 may extend longitudinally beyond the end edge 32 of the chassis 28 of the diaper 20, or the end edge 32 of the chassis 28 of the diaper 20 may extend longitudinally beyond the waist edge 72 of the fit panel 70. In a particular embodiment, the waist edge 72 of the fit panel 70 extends longitudinally beyond the end edge 32 of the absorbent chassis 28 to provide improved seals against the body of the wearer.

The fit panel 70 also defines an inward edge 76 which extends longitudinally inward towards the crotch region 26 of the diaper 20. The inward edge 76 of the fit panel 70 may be configured to remain at least partially unattached to the bodyside liner 44 or absorbent chassis 28 of the diaper 20 when in use to allow the absorbent chassis 28 to move and expand to receive and contain body exudates. Alternatively, in a particular embodiment, the inward edge 76 of the fit panel 70 may remain substantially fully attached to the absorbent chassis 28 to allow the absorbent chassis 28 to provide a close fit to the wearer's body for improved performance. The inward edge 76 of the fit panel 70 may be linear. Alternatively, the inward edge 76 of the fit panel 70 may be curvilinear, such as concave, to better fit the wearer. Desirably, if the inward edge 76 is curvilinear, the waist edge 72 may also be curvilinear such that consecutive fit panels 70 for multiple articles nest within each other and can be provided from a continuous sheet of material. In such a configuration, the inward edge 76 of the first fit panel corresponds to the waist edge 72 of the next fit panel to improve manufacturing and reduce waste.

The longitudinal length 73 of the fit panel 70 is generally sufficient to effectively distribute the fastening forces across a wide cross sectional area to provide improved fit without excessive irritation of the skin of the wearer. Desirably, the fit panel 70 defines a longitudinal length 73 which is at least about 5 percent and more desirably from about 10 to about 30 percent of the longitudinal length 52 of the diaper 20. Lengths less than the above specified ranges do not provide the improved fit and appearance of the article on the wearer and may result in excessive red marking. Whereas, lengths greater than the above specified ranges may extend too far into the crotch region 26 of the article such that the fit panel 70 may interfere with the deposition of body exudates into the diaper article.

The fit panel 70 illustrated in Figs. 1-6 extends laterally across the diaper 20 extending beyond the side edges 30 of the absorbent chassis 28. In particular, the illustrated fit panel 70 defines a lateral width 71 that is greater than the width 50 of the absorbent chassis 28 at the respective waist region to which the fit panel 70 is attached to provide the improved fit and performance. As used herein, the width 50 of the absorbent chassis 28 refers to the distance between the outermost portions of the backsheet and/or topsheet layer in the lateral direction 40 at the desired lengthwise location along the diaper 20. In a particular embodiment, the fit panel 70 defines a width 71 which is at least about 105 percent, desirably at least about 115 percent, and more desirably at least about 125 percent of the width 50 of the absorbent chassis 28 of the diaper 20 at the respective waist region. For example, the fit panel 70 may define a lateral width 71 of from about 105 to about 150 percent of the width 50 of the absorbent chassis 28 of the diaper 20 at the

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respective waist regions. Widths less than the above specified ranges do not provide the improved fit and appearance of the diaper 20 on the wearer. Alternatively, as representatively illustrated in Fig. 7, the fit panel 70 may otherwise be provided by a pair of laterally spaced apart side panels 90 and 92 connected to the side edges 30 of the absorbent chassis 28.

The fit panel 70 of the different embodiments of the present invention may be provided in a variety of ways. For example, the fit panel 70 may be a single piece of material or a combination of individual pieces or panels of material attached to the diaper using conventional attachment means such as those described above. Desirably, the fit panel 70 or at the least individual pieces or panels of the fit panel 70 comprise elastic composite materials or non-stretchable materials which have been rendered elastically contractible by means known to those skilled in the art. It is also generally desirable that the fit panel 70 be formed from materials which are substantially impermeable to liquids and which provide a more clothlike feeling. Such materials are capable of maintaining a close conforming fit while not irritating the skin of the wearer. Suitable elastomeric materials include SBL materials, NBL materials, elastomeric films, elastomeric foams, latent elastic materials and the like and combinations thereof.

In the embodiment illustrated in Figs. 1-6, the fit panel 70 includes a single piece of elastomeric material and in the embodiment illustrated in Fig. 7, each of the spaced apart side panels of the fit panel 70 include a single piece of elastomeric material. Such a single piece of material may be modified in any area or areas to provide the desired elastic properties. For example, in a particular embodiment, the elastic properties of portions of the fit panel 70 may be modified by bonding the material at specific locations or zones to render such bonded areas less elastic than the unbonded areas. The effect the bonding has on the elastic properties of the material can depend upon several factors, including the area of the bonding or the bond point density.

In a particular embodiment wherein the fit panel 70 includes an elastomeric material, it is desirable that the fit panel 70 be capable of providing an elongation in the lateral direction of at least about 5 percent, more desirably at least about 15 percent, even more desirably at least about 30 percent, and even more desirably at least about 50 percent when subjected to a tensile force load of about 80 grams in the lateral direction per lineal centimeter of the sample measured in the longitudinal direction 38. Moreover, it is also desirable that the fit panel 70 be capable of providing a tension range of from about 20 to about 400 grams, more desirably from about 40 to about 275 grams, and even more

desirably from about 60 to about 200 grams per lineal centimeter of the sample measured in the longitudinal direction 38 when subjected to an elongation of 30 percent in the lateral direction 40.

5 In another alternative configuration, the fit panel 70 may be provided by a substantially non-elastomeric material, such as polymer films, woven fabrics, non-woven fabrics, or the like such as described above as being suitable for the outer cover 42 or bodyside liner 44. Such a fit panel could be modified to render portions elastically contractible to provide the desired elastic properties to the fit panel 70 by means well known to those skilled in the art. For example, different portions of the fit panel 70 may include a plurality of elastic strands which are elongated and adhesively attached in the lateral direction 40 to the respective portions of the fit panel 70. Suitable elastic strands are known to those skilled in the art. A suitable elastic strand may be composed of a 470 decitex LYCRA elastomer or a 620 decitex LYCRA elastomer commercially available from E. I. DuPont de Nemours Co., a business having offices located in Wilmington, Delaware, or other elastomers with suitable characteristics.

Alternatively, a piece of elastic material may be adhesively attached to the respective portions of the fit panel 70 in an elongated condition to provide the desired stretchability. The piece of elastic material may include a SBL material, a NBL material, an elastomeric film, an elastomeric foam material, or the like as described above. In one embodiment, the piece of elastic material may be applied to the fit panel in a pretensioned configuration. In another embodiment, the elastic material or the entire fit panel 70 may be latent, in which case the elastic material or fit panel would initially have non-elastomeric properties, but would later be activated to impart elastomeric properties by any of various means known to those skilled in the art. Suitable latent elastic materials are well known to those skilled in the art.

The fit panel 70 of the different embodiments of the present invention may be attached to the absorbent chassis 28 of the diaper 20 in any suitable manner which provides the desired properties. For example, the fit panel 70 may be attached to the absorbent chassis using adhesive, ultrasonic, thermal bonding techniques and the like or combinations thereof. As representatively illustrated in Fig. 4, the fit panel 70 may be attached to the absorbent chassis of the diaper 20 along a lateral attachment zone 78 and a pair of opposed longitudinal attachment zones 79. In the illustrated embodiment, the lateral attachment zone 78 is generally located along or near the end edge 32 of the absorbent chassis 28 of the diaper 20 while the longitudinal attachment zones 79 are

located along the side edges 30 of the absorbent chassis 28 in the respective waist region of the diaper 20. The lateral and longitudinal attachment zones 78 and 79, respectively, generally extend in the lateral and longitudinal directions 40 and 38, respectively, but may otherwise extend at angles from the lateral and longitudinal directions depending upon the configuration of the fit panel 70 and the desired distribution of forces across the fit panel. Such angled attachment zones can result in improved fit. As illustrated, the fit panel 70 need not be attached to the absorbent chassis 28 of the diaper 20 along its entire width or length to allow additional freedom of movement for the absorbent chassis 28 relative to the fit panel 70 for improved performance.

Further, the fit panel 70 of the present invention may be attached to the absorbent chassis 28 of the diaper 20 in any location which provides the desired properties. For example, as representatively illustrated in Figs. 1-6, the fit panel 70 may be attached to the bodyfacing surface 34 of the bodyside liner 44 of the absorbent chassis 28 such that the fit panel 70 contacts the wearer's skin. In such a configuration, as representatively illustrated in Fig. 4, the inward edge 76 of the fit panel 70 may be unattached to the absorbent chassis 28 such that a pocket exists to contain body exudates. The illustrated pocket is defined by the inward edge 76, the lateral attachment zone 78 and the longitudinal attachment zones 79. Alternatively, the inward edge 76 of the fit panel 70 may be substantially fully attached to the absorbent chassis 28.

The fit panel 70 may otherwise be attached to the garment facing surface 36 of the outer cover 42 of the absorbent chassis 28 such that the fit panel 70 gives a more trim appearance to the diaper 20 during wear. In yet another embodiment, the fit panel 70 may be sandwiched between the inner surfaces of both the bodyside liner 44 and the outer cover 42, both of which face the absorbent core 46.

The disposable diaper of the different aspects of the present invention further includes a refastenable fastening system 60 for securing the diaper about the waist of the wearer. The fastening system 60 includes fasteners located on one of the waist regions 22 and 24 of the diaper 20 which are configured to releasably engage the opposite waist region of the diaper 20 to maintain the diaper about the waist of the wearer. The use of fasteners which are refastenable or releasably engageable allows for ease of securing and removing the diaper 20 from the waist of the wearer without undesirably soiling the wearer. The use of refastenable fasteners further readily allows for the inspection of the inside of the diaper 20 to determine if it has been soiled with the ability to refasten if it is not soiled.

The refastenable fastening system 60 representatively illustrated in Figs. 1-6 includes a pair of primary fasteners 62, one located on each laterally opposed side 74 of the fit panel 70 in the rear waist region 24 of the diaper 20. In such a configuration, the primary fasteners 62 are configured to refastenably engage the garment facing surface 36 of the absorbent chassis 28 in the front waist region 22 to provide the diaper 20. Alternatively, the primary fasteners 62 may be located on the front waist region 22 and may be configured to releasably engage the garment facing surface 36 in the rear waist region 24 of the absorbent chassis 28 to provide the diaper 20.

Desirably, the primary fasteners 62 are configured to directly refastenably engage the garment facing surface 36 of the outer cover 42 of the absorbent chassis 28 of the diaper 20 to provide improved fit and ease of fastening. Alternatively, as representatively illustrated in Figs. 1-3, the disposable diaper of the present invention may further include an attachment panel 66 located on the outer cover 42 in one of the waist regions 22 and 24 of the diaper 20. In such a configuration, the primary fasteners 62 are configured to refastenably engage the attachment panel 66 to provide the diaper 20 and maintain the diaper 20 about the waist of the wearer. When the primary fasteners 62 are releasably engaged, the side edges 30 of the absorbent chassis 28 define leg openings which are configured to encircle the legs of the wearer and the waist regions 22 and 24 of the absorbent chassis 28 define a waist opening which is configured to encircle the waist of the wearer. In the illustrated embodiments, the attachment panel 66 is a single piece of material which extends substantially across the respective waist region of the diaper 20. Alternatively, the attachment panel 66 may include two separate panels located along the opposed side edges of the absorbent chassis 28 in one of the waist regions 22 and 24 of the diaper 20.

If the diaper 20 becomes soiled during use, the primary fasteners 62 can be disengaged to easily remove the diaper 20 from the waist of the wearer with reduced risk of undesirably soiling the clothes or legs of the wearer. The primary fasteners 62 can also be easily disengaged to inspect the diaper 20 for possible soiling. Moreover, the primary fasteners 62 can be repositioned if necessary to adjust the fit of the diaper to the wearer.

Suitable fasteners are well known to those skilled in the art and can include adhesive tape tab fasteners, hook and loop fasteners, mushroom fasteners, snaps, pins, belts and the like, and combinations thereof. For example, as representatively illustrated in Figs. 1-6, the primary fasteners 62 may be hook type fasteners and the outer cover 42 or attachment panel 66 may be configured to function as a complimentary loop type fastener. Desirably,

the primary fasteners 62 are hook type fasteners which are releasably engageable directly with the outer cover 42. Such an arrangement provides the ability to vary the size of the waist opening in very small increments over a wide range to fit the waist of the wearer.

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The fastening system 60 on the disposable diaper 20 of the present invention also includes an integrated waist size adjustment mechanism to further conform the waist regions of the diaper to the wearer without having to reposition the primary fasteners 62. For example, as representatively illustrated in Figs. 1-6, the diaper 20 may include at least one secondary fastener tab 84 to provide improved securement of the diaper 20 about the waist of the wearer after the primary fasteners 62 have been releasably engaged. In particular, the secondary fastener is configured to further conform the waist regions 22 and 24 of the diaper 20 to the waist of the wearer. For example, as representatively illustrated in Figs. 1-6, the diaper 20 of the present invention may include a pair of secondary fasteners tabs 84 and 86. Alternatively, the diaper 20 may include a single secondary fastener tab.

In the illustrated embodiments, the secondary fasteners 84 and 86 are located within or integral with the laterally opposed sides 82 of the fit panel 70 of the diaper 20. In use, the secondary fastener tabs 84 and 86 are configured to encircle the hips of the wearer and engage the garment facing surface 36 of the absorbent chassis 28 of the diaper 20. In the illustrated embodiments, the fit panel 70 is located in the rear waist region 24 of the absorbent chassis 28. In such a configuration, the secondary fastener tabs 84 and 86 are configured to encircle the hips of the wearer and engage the garment facing surface 36 in the front waist region 22 to further conform the waist regions to the wearer. Alternatively, if the fit panel 70 is located in the front waist region 22, the secondary fasteners 84 and 86 may be configured to releasably engage the garment facing surface 36 in the rear waist region 24 of the absorbent chassis 28 to further conform the waist regions to the wearer.

Desirably, the secondary fastener 84 is releasably engageable directly with the garment facing surface 36 of the outer cover 42 of the absorbent chassis 28 to provide improved ease of fastening. Alternatively, as described above and representatively illustrated in Figs. 1-3, the diaper 20 of the present invention may further include an attachment panel 66 located on the outer cover 42 in one of the waist regions 22 and 24 of the diaper 20. In such a configuration, the secondary fastener 84 may also be releasably engageable with the attachment panel 66 to further conform the diaper 20 to the waist of the wearer.

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The use of the secondary fastener has been found to be particularly desirable when placing the diaper on wearers which are particularly active. In such a situation, the waist opening of the diaper 20 when the primary fasteners 62 are engaged may not be sufficiently close to the wearer's body which may undesirably result in leaks. In such a configuration, the secondary fastener of the diaper 20 of the present invention is configured to conform the waist regions of the diaper 20 to the wearer after the diaper is initially secured about the wearer. Thus, the care giver is not required to reposition the primary fasteners 62 to conform the waist regions 22 and 24 to the waist of the wearer.

In such configurations, the secondary fastener 84 is intended to maintain the diaper 20 in a close conforming fit about the waist of the wearer to reduce the leakage of body exudates when in use. The secondary fastener 84 may also be selectively disengaged to facilitate inspection of the diaper 20 to determine if it has been soiled. The primary fasteners 62 can also provide a "childproofing function" by maintaining the diaper 20 at least partially secured about the waist of the wearer if the wearer disengages the secondary fastener 84.

The secondary fastener 84 may be provided in a variety of ways. For example, as representatively illustrated in Figs. 1-6, the fit panel may include a pair of laterally directed perforations 80 on at least one laterally opposed side 82 of the fit panel 70 which are configured to provide at least one secondary fastener tab 84. The illustrated fit panel 70 includes such perforations on both sides of the fit panel 70 thereby providing a pair of secondary fastener tabs 84 and 86. The laterally directed perforations 80 may be either parallel or non-parallel. Further, the perforations 80 may be either straight or curvilinear. In a preferred embodiment, as representatively illustrated in Figs. 1-6, the secondary fastener tab is provided by a pair of laterally directed, straight, parallel perforations 80 on at least one laterally opposed side 82 of the fit panel 70.

The perforations 80 are configured such that, in use, the caregiver would tear the fit panel 70 along the laterally directed perforations 80 to create at least one secondary fastener tab 84. The secondary fastener tab 84 defines both an outwardly directed, unattached, free end, and an inwardly directed end which remains attached to the fit panel 70. In such a configuration, after the perforations 80 are torn, the free end of the secondary fastener tab 84 or 86 may be elongated in the lateral direction 40 as representatively illustrated in Figs. 1, 2 and 6.

The secondary fastener tab, by virtue of being integral with and created from the fit panel 70, may comprise the same fastener type as the primary fasteners 62 already located on the edges 74 of the fit panel 70. For example, as illustrated, the perforations 80 may extend into the primary fasteners 62 such that, when torn, the secondary fastener tab includes a portion of the primary fastener 62. Alternatively, the fit panel 70 may include at least one separate secondary fastener attached to the secondary fastener tab thereto.

Suitable fasteners for the secondary fastener are described above as being suitable for the primary fastener. For example, as representatively illustrated in Figs. 1-6, the primary fasteners 62 and secondary fasteners 84 and 86 may be hook-type fasteners and the outer cover 42 or attachment panel 66 may be configured to function as a complimentary loop-type fastener. Desirably, the fasteners 62, 84, and 86 are hook-type fasteners which are releasably engageable directly with the outer cover 42. Such an arrangement provides the ability to vary the size of the waist opening in very small increments over a wide range to fit the waist of the wearer. The fasteners may have any shape and size which provides the desired fastening of the diaper 20 about the waist of the wearer.

The secondary fastener tab may define any length and width which provides the desired improved fastening and fit about the wearer. For example, the secondary fasteners tabs 84 and 86 in the illustrated embodiment, may each define a length 87 in the lateral direction 40 as illustrated in Fig. 5, which is at least about 5 percent, desirably at least about 20 percent, and more desirably at least about 35 percent of the lateral width 71 of the fit panel 70. Further, the secondary fasteners 84 and 86 may each define a width 88 in the longitudinal direction 38 which is at least about 10 percent, desirably at least about 30 percent, and more desirably at least about 50 percent of the longitudinal length 73 of the fit panel 70.

The different aspects of the present invention advantageously provide disposable absorbent articles which may include the combination of at least one fit panel, a pair of primary fasteners and an integral waist size adjustment mechanism, such as the illustrated secondary fastening tab. The fit panel is configured to elongate in the lateral direction to provide an improved fit and appearance of the diaper about the wearer by initially providing a conforming fit about the wearer and maintaining such fit throughout the use of such article. The fit panel is also configured such that the absorbent chassis has the ability to expand, contract, and receive body exudates without adversely affecting the positioning of the fit panel and the diaper about the waist of the wearer.

The primary fasteners are configured to refastenably engage the front and rear waist portions to secure the article about the waist of the wearer. Moreover, the fastening system includes at least one secondary fastener to provide improved securement of the diaper about the waist of the wearer after the primary fasteners have been releasably engaged. As a result, the absorbent articles of the present invention are designed to conform to the body of the wearer to effectively contain bodily exudates. Moreover, similar to conventional diapers, the absorbent articles of the present invention can advantageously be applied to and removed from the wearer with relative ease and cleanliness.

Having thus described the invention in rather full detail, it will be readily apparent to a person of ordinary skill that various changes and modifications can be made without departing from the spirit of the invention. All of such changes and modifications are contemplated as being within the scope of the present invention as defined by the subjoined claims.